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NOTE ON THE REDUCTION OF FERRIC SALTS.

BY GILBERT T. MORGAN, D.Sc.

(Read at the Meeting, May 1, 1901.)

ATTENTION has often been drawn to the fact that zinc is far from being an ideal reducing agent for ferric salts. Scheiding (*Zeit. angew. Chem.*, 1895, 79) has shown that very elaborate precautions, involving the use of a large excess of zinc and very dilute iron solutions, are necessary in order to obtain trustworthy results, one important point being the digestion of the materials in the cold for five or six hours. Even after dissolving a considerable excess of the metal in boiling acidified solutions of ferric salts, it is frequently noticed that an appreciable amount of iron still remains in the higher state of oxidation, the hydrogen evolved from zinc dissolving in cold solutions seems to be more efficacious in reducing ferric iron than that set free at higher temperatures; but, on the other hand, the dissolution of the metal proceeds somewhat slowly in the cold, and hence the method is not suitable for practical requirements. Various modifications of the process have been put forward with a view of accelerating the reduction. Beche (*Chem. News*, liii., 269) suggests the use of amalgamated zinc supported on platinum foil; Carnegie (*J.C.S.*, 1888, liii., 468) employs zinc-dust and feebly-acid solutions of the ferric salt: the reduction is very rapid, and the method gives accurate results when the reducing agent is free from iron and other substances which decolorize permanganate or dichromate solutions. In the following process, which admits of the use of pure zinc, either granulated or in sheets, the efficiency of the metal is considerably increased by employing it in the form of the zinc-copper couple.

A weighed portion (4 to 6 grammes) of ferric ammonium sulphate was dissolved in 100 c.c. of dilute sulphuric acid (3 per cent.) and the cold solution poured on to a zinc copper couple, produced by immersing 8 grammes of granulated zinc for two to three minutes in 200 c.c. of a 10 per cent. solution of copper sulphate; a vigorous action set in, and after ten minutes a drop of the solution no longer gave the thiocyanate coloration. The reduced solution, decanted from the couple and rapidly filtered to remove any floating particles of metal, was made up to 250 c.c. with recently-boiled dilute sulphuric acid, and aliquot portions were then withdrawn and titrated with standard permanganate solution.

The percentage of iron in the specimen of ferric alum employed was 11.50, as indicated by two concordant gravimetric analyses, whilst two volumetric estimations carried out in the manner indicated gave 11.34 and 11.44.

Under these experimental conditions the amount of zinc required to reduce the quantities of ferric salt usually taken for volumetric estimations is comparatively small, and the couple may be employed for several determinations. Owing to this diminution in the quantity of the zinc involved, the deduction to be made for the reducing action of the impurities in the metal becomes so small as to be almost negligible. In the foregoing experiments, where fairly pure zinc was employed, a blank experiment showed that less than 0.05 c.c. of the permanganate solution (1 c.c. = 0.0056 Fe) was decolorized, therefore for ordinary purposes no correction need be made.

In describing the zinc method of reduction, Fresenius (*Quant. Chem. Analysis*, i., 224) emphasizes the importance of dissolving all the metal before titrating by referring to a statement made by Mitscherlich (*Journ. Prakt. Chem.*, 1861, lxxxvi., 3), to the effect that the zinc precipitates notable quantities of iron, which only redissolve as the reducing-agent passes into solution. At the time the observation was published, however, Fresenius seems to have been somewhat sceptical as to its accuracy (*Zeit. Analyt. Chim.*, ii., 72).

The foregoing results show that the precipitation of iron does not occur to any appreciable extent when the ferric salt is reduced by the zinc-copper couple, nor could any loss of iron be detected when the experiments were repeated with excess of granulated zinc, the ferrous solutions being decanted from the undissolved metal. Two concordant analyses made in this manner gave the percentage of iron in the alum as 11.47.

Further confirmation of these results was obtained by estimating the iron in pianoforte-wire. Weighed portions (0.3 to 0.5 gramme) dissolved in 30 c.c. of 15 per cent. sulphuric acid, oxidized to the ferric condition by potassium permanganate, and then again reduced to the ferrous state by the zinc-copper couple, were titrated with standard permanganate solution, two determinations giving the percentage of iron as 99.57 and 99.53.

Mitscherlich stated that the quantity of iron precipitated by the zinc is "ziemlich bedeutend," whereas these experiments indicate that, even if any such precipitation occurs, the consequent loss of iron is well within the limits of the experimental error of an ordinary volumetric analysis, and accordingly the ferrous solution may be separated from the reducing-agent as soon as the reduction of the ferric salt is complete.

The zinc-copper couple may be employed with advantage for reducing ferric salts in hydrochloric acid solution, the action being far more rapid than that of zinc or ammonium hydrogen sulphite; it is therefore applicable for the volumetric analysis of iron ores with standard bichromate solutions. The percentage of iron in a sample of red hematite was 64.13, as determined by the use of the couple, the value 64.04 being obtained by the ammonium hydrogen sulphite method.

When the zinc-copper couple or granulated zinc is added to a neutral solution of ferric alum a portion of the iron is precipitated as basic sulphate. The whole of the

iron thus rendered insoluble is in the ferric condition, whereas the portion remaining dissolved is entirely converted by the reducing agent into the ferrous state. The brown precipitate, which rapidly forms when the couple is employed, readily dissolves in dilute acid, and the reduction then follows the normal course.

THE EXAMINATION OF COMMERCIAL MALT EXTRACTS.

By W. J. SYKES, M.D., AND C. A. MITCHELL, B.A.

(Read at the Meeting, December 5, 1900.)

HAVING had occasion to examine several samples of commercial malt extract, it was deemed advisable to extend the analyses so as to include typical preparations in the market. The methods employed and the results obtained are given below.

Such malt extract should be prepared from low-dried and therefore highly diastatic malts, so that the product may contain a large amount of diastatic power. In its manufacture, as a rule, the malt is first mashed in cold water, sufficient water at a temperature of 30° C. (86° F.) being subsequently added to bring the temperature of the mash to 55° C. (131° F.). The resulting wort is then evaporated under diminished pressure at a temperature not exceeding 55° C. (131° F.) until it has attained a syrupy consistence.

Malt with a diastatic power of 50 on Lintner's scale is readily obtained, and by special treatment malt with a much higher diastatic power than this can be manufactured.

In order to ascertain if it were possible to retain the whole of the diastatic power of the malt in the resulting extract the following experiments were made:

1. Wort from a malt with a diastatic power of 16.6 was evaporated very slowly under diminished pressure, CO₂ being passed through the flask when evaporation was not proceeding. Final product dark and turbid, diastatic power nil.

2. Wort from malt with a diastatic power of 18 concentrated in partial vacuum to one-fifth its bulk. Product turbid, and did not yield clear solution; evidently there had been some bacterial fermentation proceeding. Diastatic power 11.

3. Similar wort concentrated on water-bath at 100° to 110° F. and completed *in vacuo* over sulphuric acid. On diluting the product to the initial volume, a bright solution was obtained with a diastatic capacity of 18—that is, the same as the original.

From these it appears that it is possible to obtain a malt extract in the manufacture of which none of the diastatic power of the original malt has been lost.

Nitrogenous Constituents, Ash and Phosphoric Acid.—The amount of the soluble constituents of malt varies, it being dependent on these actually present in the raw barley, the temperature at which the malt is grown, and upon other conditions.

The natural variation in barley is well shown by the following results obtained by Gordon Salamon (*Journ. Soc. Chem. Ind.*, 1885).

PERCENTAGE OF SIXTEEN SAMPLES.

			Ash.	Total N.	Soluble N.	P ₂ O ₅ .
Highest	...	...	3.41	1.70	1.193	1.10
Lowest	...	...	2.09	1.27	0.662	0.635

The following are results obtained by ourselves from twelve different malts dried at temperatures of about 130° F. In each case a wort of a specific gravity of 1030 (water = 1000) was prepared at a temperature not exceeding 156° F., and the results multiplied by 10, so as to correspond approximately with an average commercial malt extract :

		Ash.	P ₂ O ₅ .	Total N.	N precipi- tated by ZnSO ₄ .	N as Ammonia.
Highest	...	1.66	0.72	0.69	0.09	0.14
Lowest	...	1.44	0.40	0.40	0.08	0.05
Average	...	1.57	0.56	0.59	0.08	0.05

In reference to the influence of the temperature at which the malt has been germinated on the nitrogenous constituents, the following figures published by Day (1891) are instructive :

TEMPERATURE OF GERMINATION.

N.—substances soluble at		40° F.	50° F.	55° F.	60° F.	65° F.	75° F.
104° F. × 6.33	...	40° F.	50° F.	55° F.	60° F.	65° F.	75° F.
Permanently soluble	...	2.70	4.13	4.19	3.80	3.49	3.29
Coagulated on boiling	...	0.31	0.43	0.45	0.51	0.50	0.48

Besides these factors, the amount of soluble nitrogenous constituents will naturally vary with the temperature at which the malt is dried, etc., and with the manner in which the extraction is made. In the table of the results given by commercial malt extracts, Nos. 3 and 5 were stated by the manufacturers to have been overheated. They had a slightly burnt odour and were of a dark brown colour, though, curiously, they still possessed some diastatic power. The soluble nitrogen here amounted to only 0.40 per cent., whereas the usual amount is about 0.65 per cent.

The Carbohydrates.—As the initial action of the diastase takes place at a very low temperature, the transformation will almost invariably be that of the No. 8 equation, the yield being practically 80 per cent. of maltose and 20 per cent. of dextrin. Possibly some further degradation of the dextrin may take place if the wort is allowed to stand for any considerable length of time before concentration. No attempt has been made to determine the relative amount of these constituents ; the amount of copper reduced has been simply calculated into maltose.

METHOD OF ANALYSIS.

Determination of the Total Solids.—Ten grammes of the sample were dissolved in water, made up to 100 c.c. and filtered. As a rule, the amount of insoluble matter was insignificant ; when this was not the case it was estimated. The specific gravity of the solution was then taken at 15° C., and the amount of solid matter present found by reference to Schultzze's table. The portion of this within which commercial malt extracts diluted in this way will be found to fall is given below. To save space, the intermediate values are omitted, but they may be found by interpolation :

SCHULTZE'S TABLE FOR DETERMINATION OF EXTRACT FROM THE SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Grammes in 100 C.c.	Specific Gravity.	Grammes in 100 C.c.
1.0250	6.60	1.0300	7.94
1.0255	6.75	1.0305	8.06
1.0260	6.88	1.0310	8.18
1.0265	7.03	1.0315	8.29
1.0270	7.18	1.0320	8.42
1.0275	7.32	1.0325	8.54
1.0280	7.46	1.0330	8.68
1.0285	7.58	1.0335	8.82
1.0290	7.70	1.0340	8.96
1.0295	7.82		

Determination of Phosphoric Acid.—This was made by the method first described by Hehner, the P_2O_5 being precipitated as phosphomolybdate, weighed as the ammonium compound, and the result divided by 28.5.

Determination of Albumose Nitrogen.—So far as we are aware, the statement of Bömer that $ZnSO_4$ can replace $(NH_4)_2SO_4$ has not been confirmed for malt extracts. We have tried "salting out" with both sulphates, and have obtained practically identical results :

NITROGEN PRECIPITATED BY			
$(NH_4)_2SO_4$.			$ZnSO_4$.
1. 0.09	...	...	0.085
2. 0.157	}	...	0.0148
0.127			

Nitrogen precipitated by Bromine.—In some cases determinations were made of the N precipitated by Br in the filtrate from the $ZnSO_4$ precipitations by Allen's modification of Rideal and Stewart's method. It was found that the amount precipitated in this way closely approximated to that of the albumose nitrogen, and to that precipitated by phosphotungstic acid.

It should be mentioned, however, that a recent paper by Schjerning (ANALYST, xxvi., 77) shows that bromine precipitates certain non-proteid nitrogenous constituents, and that, on the other hand, it only precipitates part of the proteids of separated milk and blood serum.

Specific Rotatory Power.—This was determined in the 10 per cent. solution and calculated on the total solids. For clarifying, it was found that if a little kieselguhr was shaken up with the solution previous to filtration a brilliant filtrate was readily obtained.

Diastatic Power.—The malt extract made in the laboratory and employed in the estimation of the diastatic power of a malt is prepared by extracting 25 grammes of malt with 250 c.c. of water ; it has a specific gravity of about 1.013 (water = 1.000), and contains about 3.4 per cent. solid matter. As the figures given for a commercial malt extract, this must necessarily be of a purely empirical nature. It was decided to dilute the sample under examination to a specific gravity of 1.013—that is, to the same specific gravity as the malt extract used in determining the diastatic power of a malt, and to calculate the result in the same way as if examining a malt. This will

give a rough estimate of the amount of diastatic power which has been lost during the manufacture of the extract where that of the malt is known and may at times prove useful. For example, a commercial malt extract was diluted until the resulting solution had a specific gravity of 1013; 1 c.c. of this was added to 100 c.c. of a 2 per cent. solution of soluble starch, and after the prescribed treatment the reduced copper weighed. A correction for the reducing bodies was then made by treating 1 c.c. of the diluted extract with 50 c.c. of Fehling's solution and 100 c.c. of water, the weight of reduced copper being deducted from that previously found, and the calculation made in the following manner:

$$\frac{0.1314 - 0.0219}{0.438} \times 100 = 25 \text{ diastatic capacity.}^*$$

Obviously, Lintner's tube method may also be employed, using for the determination of the reducing substances present four times the quantity of the diluted solution used in the first determination, and making allowance for this afterwards. The operation is, however, more tedious.

COMPOSITION OF COMMERCIAL MALT EXTRACTS.

The following table gives the complete results of the analyses of a series of malt extracts, also of several substances which might be used as adulterants:

	Water.	Total Solids.	Ash.	Phosphoric Acid (P_2O_5).	Total Nitrogen.	Albumose N.	N precipitated by Phos- photungstic Acid.	Ammoniated N.	Reducing Substances as Maltose.	Specific Rotation [α_D] of Solids.	Diastatic Capacity.
1. Wort evaporated on water-bath	18.80	81.20	1.60	0.67	0.69	0.09	—	0.05	—	97.2	—
2. Medicinal ...	19.90	80.10	1.04	0.49	0.70	0.15	0.103	0.09	59.5	109.8	21.6
3. French ...	19.9	80.1	1.62	0.50	0.42	0.098	0.21	0.021	51.04	117.3	12.0
4. „ ...	18.2	81.8	1.62	0.52	0.79	—	—	0.032	52.3	110.2	10.0
5. "Scotch" ...	23.4	76.6	1.90	0.76	0.53	—	—	—	54.0	97.9	13.0
6. English medicinal ...	21.1	78.9	1.32	0.53	0.77	0.19	—	—	56.0	111.5	5.6
7. English medicinal ...	21.3	78.7	1.75	0.77	{ 1.52 } { 1.52 }	0.17	0.19	—	56.2	63.5	100.0
8. English medicinal ...	19.9	80.1	2.20	0.66	1.03	—	—	—	56.1	87.3	25.7
9. English medicinal ...	17.5	82.5	1.60	0.75	0.68	—	—	—	51.4	115.1	22.0
10. Baker's ...	24.4	75.6	2.10	0.79	0.98	0.14	—	—	52.56	85.9	24.0
11. "Diastase" ...	21.1	78.9	3.90	1.15	2.25	—	—	—	45.6	38.1	115.0
12. Glucose ...	15.8	84.2	0.55	0.065	0.20	—	—	—	62.8	128.2	—
13. Maltodextrin, "non-fermentable"	24.9	75.1	0.55	0.23	0.19	—	—	—	50.3	153.1	—
14. Dextrin syrup	18.0	82.0	1.0	0.24	0.30	—	—	—	55.68	134.1	—

Of the malt extracts given in this table, No. 1 was a sample of wort evaporated on the water-bath to a specific gravity of 1.330.

* For fuller details of this method see the author's paper, ANALYST, xxi, 122.

Nos. 3 and 4 were of French origin. The manufacturers stated that these had been spoiled by overheating. They had rather a treacly odour, and were very dark in colour. The overheating would account for the low total nitrogen of No. 3, though, as already pointed out, their diastatic capacity had not been entirely destroyed. No. 5 was sold as "Scotch" malt extract, but we have reason to believe that it too was French.

Nos. 6 to 9 were all specimens of English medicinal extract. No. 7, which had the highest diastatic capacity of any of the extracts, excluding No. 11, is remarkable for its high total nitrogen.

No. 8, medicinal, No. 10, Baker's malt extract, and No. 11, "diastase," were all from the same manufacturer. They all showed a high ash and a low percentage of reducing substances. Probably some other process than simple evaporation had been used in their manufacture.

The "diastase" had a bitter taste and granular appearance. It contained a large amount of insoluble matter and a high percentage of nitrogen.

No. 12 was a specimen of ordinary glucose syrup; No. 13, "non-fermentable" dextrin syrup; and No. 14, a specimen of the so-called "malto-dextrin" syrup.

In conclusion, we wish to express our best thanks to the different manufacturers for the courteous manner in which they have placed samples of their preparations at our disposal, and also to Dr. L. T. Thorne and Mr. A. R. Ling for assistance in the experimental portion of the paper.

DISCUSSION.

Mr. HEHNER asked how the authors accounted for the very low specific rotatory power of sample No. 11, and also whether the result of their investigation was not to show that the diastatic power of these so-called malt extracts was very little, if any, greater than that of the malt itself.

Mr. BAKER said that malt extracts with comparatively high diastatic powers were obtained when the malt infusions were evaporated under reduced pressure. The diastatic power of the malt employed (on Lintner's scale) in such cases might be between 80 and 120, and that of the extracts between 120 and 500. Such extracts were used in many breweries where malt substitutes were employed; and they were also used as yeast foods. They were rich in the so-called maltopeptones—a recognised yeast recuperator.

Mr. CHAPMAN said that the following were the results of an analysis which he had made of a material of the class referred to:

Maltose	...	...	...	...	...	45.06
Dextrin	...	...	...	...	...	7.20
Invert sugar	...	...	...	...	...	14.49
Cane sugar	..	...	...	...	...	3.40
Ash	...	...	...	...	...	1.70
Water	...	...	...	...	...	21.76
Undetermined (including albuminoids, etc.)	...	...	...	...	...	6.39
						100.00
Specific rotatory power (of the sample itself)	...	...	...	...	...	+66.2

The large proportion of invert sugar was rather remarkable, though he did not know whether the sample was genuine or whether it contained added invert sugar. The ready formed sugars of the malt would account for some invert sugar, though probably not for so much as this sample contained.

Mr. MITCHELL, in reply, said that the low specific rotatory power of sample No. 11 was probably due to the absence of carbohydrates and consequent increase in other substances. It would be noted that the proportion of total nitrogen in this sample was 2.25 per cent., representing a proportionately large quantity of proteids. Possibly, too, some method of precipitation—with ammonium sulphate, for instance—had been employed in addition to concentration, to increase the proportion of diastase in the sample. He could quite understand that, starting with a low-dried malt, extracts could be obtained of the high diastatic powers mentioned by Mr. Baker, though he had not himself met with any so high. It was not perfectly fair to compare the diastatic powers of these extracts according to Lintner's scale. The figures ought to be multiplied to correspond with the specific gravity of the extracts, which was much greater than that of a wort corresponding to the extract on which Lintner's determination was made.

ABSTRACTS OF PAPERS PUBLISHED IN OTHER JOURNALS.

FOODS AND DRUGS ANALYSIS.

The Colouring Matter of Butter and Substitutes. J. Vandriken. (*Ann. Pharm.*, 1901, vii., 110; through *Chem. Zeit. Rep.*, 1901, 106.)—Stale amyl nitrite (*i.e.*, a product acid with nitrous acid) bleaches natural butter, but does not affect a factitious material or margarine unless it has been coloured with annatto. The test may be applied by treating 2 c.c. of filtered fat with an equal volume of ether, then adding 6 to 10 drops of the acid amyl nitrite and shaking; if the butter is pure, the colour should disappear at once. Or the ethereal solution may be agitated with 25 or 30 drops of "spirit of nitrous ether," when decolorization will be slower. Amyl nitrite bleaches annatto, hardly affects safranine tincture, does not change turmeric or carrot juice, and has no effect upon another (unknown) dyestuff largely used at present in the tinting of butter.

F. H. L.

(A number of coal-tar yellow colours are decolorized by acid nitrite, and such colours are used for colouring butter.

O. H.)

Examination of Pepper. A. L. Winton, A. W. Ogden and W. L. Mitchell. (*Twenty-second Annual Report of the Connecticut Experimental Station.*)—The authors have found that the amount of nitrogen in the fixed ether-extract is a useful datum

in judging of the quality of pepper. They proceed as follows: Two grammes of the powdered sample are extracted with ether for twenty-four hours, the ether allowed to evaporate at the temperature of the room in a weighed dish, and the residue in the dish allowed to stand for eighteen hours over sulphuric acid. This gives the total ether-extract. The residue is then heated to 100° C., and kept at this temperature for six hours, when the temperature is raised to 110° until the weight is constant. This gives the fixed ether-extract. The amount of nitrogen is then determined in this extract by the Kjeldahl-Arnold process. The following table shows the percentage of nitrogen in the ether-extracts of various samples of pepper, etc.:

		Maximum.	Minimum.	Average.
Black pepper (14 samples	...	0.40	0.27	0.33
White pepper (11 samples)	...	0.34	0.26	0.30
Pepper hulls		—	—	0.09
Pepper hulls and dust		—	—	0.14
Long pepper		—	—	0.22
Buckwheat hulls		—	—	0.00

H. L.

The Valuation of Gum Arabic. O. Fromm. (*Zeit. anal. Chem.*, 1901, xl., 143-168.)—The author has made a series of investigations to determine the value of certain physical and chemical data as criteria of the value of a sample of gum as an adhesive agent.

Preparation of a Standard Solution.—In each case a solution of a specific gravity of 1.035 at 15° C., is prepared, this corresponds to about 10 per cent. of air-dried gum, and 8.5 grammes of anhydrous substance. An average sample of about 50 grammes is coarsely powdered, and shaken at intervals with 200 c.c. of water. The next morning it is filtered through muslin into a 500 c.c. cylinder, and diluted with water to a specific gravity of 1.035.

Frothing of the Solution.—The frothing properties, which all gums possess to a greater or less degree, is attributed by Wiesner (*Rohstoffe des Pflanzenreichs*, i., 85) to the presence of enzymes. In selecting a sample preference should be given to one which froths least, since frothing has an injurious effect on gumming machines.

Insoluble Matter.—The residue on the filter, consisting of mineral matter and substances which swell up on treatment with water without dissolving, is washed with water into a measuring cylinder, where the next day the amount of sediment is read. Its amount varies from an insignificant quantity to 50, 60, or 70 c.c. from 50 grammes of gum.

Viscosity of the Solution.—This is determined in Engler's viscosimeter at 20° C., and compared with the viscosity of water at the same temperature. As a rule, the results obtained by the author were about 2. The highest were 2.65-2.8 and 6.27, and the lowest 1.13.

The Acid Value.—Fifty c.c. of the standard solution are titrated with $\frac{N}{10}$ sodium hydroxide, and the results expressed in c.c. The figures thus obtained varied from

1.5 to 9.8 c.c., the mean being 2.1 c.c. The number of c.c. multiplied by 0.9112 gives the number of milligrammes of sodium hydroxide required to neutralize 1 gramme of the anhydrous gum. The factor 1.2731 gives the corresponding amount of potassium hydroxide.

Experiments made by the author show that the acidity of the solution steadily rises on keeping, and it is therefore advisable to invariably make the determinations at the same period, preferably on the day after the solutions have been made. The specific gravity of the solutions had not altered after keeping for a month, but the viscosity had decreased by an insignificant amount.

The Rotatory Power.—This is determined in a 100 millimetre tube. The author found the best varieties without exception to give a negative reading. The direct angle of rotation, α_D , rose as high as -3° (corresponding to a specific rotation $[\alpha]_D = -34^\circ$). As a rule, it was between -2° and -3° (corresponding to $[\alpha]_D -23^\circ$ and -34°). Rotations below -2° and positive readings were exceptional.

Behaviour towards Reagents.—Nearly all the specimens examined by the author gave a thick precipitate with lead acetate, but in exceptional cases no precipitate was obtained with certain dark-coloured varieties, such as Amrad or Gesirah gum.

The statement of the text-books that gums do not reduce Fehling's solution is stated to be absolutely false; the author almost invariably obtained a perceptible, though usually a slight, reduction.

Determination of the Tenacity.—Dalén's method is recommended for comparative determinations. The mean breaking strain and elasticity of a suitable absorbent paper are determined, and also the mean weight of strips, 18 centimetres $\times$ 15 millimetres, under the average conditions of atmospheric moisture (65 per cent.). Pieces of this paper are now placed on the solution of gum spread on a glass plate, and after removal of the excess of gum, dried in an atmosphere in which the moisture is 65 per cent. When dry, twenty strips are cut from the gummed paper, and the breaking strain again determined.

The method is illustrated by the following example :

The gummed paper had a mean breaking strain in one							
direction of	...	...	...	...	...	...	6.52 kilos
And in another direction of	...	...	...	...	...	...	4.895 „
Mean	...	...	...	...	...	...	5.7075
The ungummed paper had a mean breaking strain of...							2.902
Difference	...	...	...	...	...	...	2.8055
Ten gummed strips weighed	...	...	...	...	...	2.3555	grammes
Ten ungummed strips weighed	...	...	...	...	...	2.0055	„
						0.350	gramme.

Therefore one strip contained 0.035 gramme of gum. The length of a hypothetical

strip of gum 15 millimetres broad, weighing 2.8055 grammes, is then calculated from the proportion :

$$0.035 : 0.18 = 2.8055 : x$$

where $x = 14.43$ kilometres.

The result thus obtained is used to express the degree of tenacity of the gum in a solution of specific gravity 1.035 and with a particular paper, and is only relative.

Elasticity.—It is well known that gummed paper has a tendency to curl up, and that when unrolled the layer of gum cracks. The author attributes this to the smaller degree of elasticity of the gum, for the greater the elasticity, as found in tearing experiments with gummed strips, the less the trouble experienced from this source. As a rule, the difference between the elasticity of the gummed and ungummed strips of paper expressed in percentages was somewhat over 2. Only inferior varieties gave values of less than 1.9, whilst in exceptional instances the values 1.51 to 1.68 were obtained.

Representative Analyses.—The following table may be given from the author's results as typical of good, medium, and bad varieties of gum :

Commercial Name.	Price per 100 Kilos.	Solution, Specific Gravity 1.035.	Frothing.	Insoluble Matter from 50 Grammes.	Viscosity at 20° C.	Acid Value $\frac{N}{10}$ NaOH.	Rotation α_D .	Action on Fehling's Solution.	Elasticity.	Tenacity.
Senegal...	Marks 170	very pale	moderate	c.c. 35	2.41	c.c. 2.3	-2° 47'	very slight reduction	Per cent. 2.13	14.8
Kordofan	190	pale	„	15	2.17	4.45	-2° 29'	some reduction	2.10	15.2
„	145	„	slight	52	2.23	2.35	-2° 47'	very slight reduction	2.13	15.3
Senegal...	158	pale	strong	8	1.87	2.15	-2° 51'	perceptible reduction	2.19	13.0
„	172.5	„	„	10	1.69	2.1	-1° 44'	some reduction	2.12	11.2
Kordofan	128	very pale	moderate	11	1.59	2.3	-2° 36'	perceptible reduction	2.10	11.3
Senegal...	143	yellowish	„	35	1.9	2.0	-2° 27'	some reduction	2.15	12.7
*Senegal...	115.5	light brown	moderate	18	1.58	2.25	-about 1°	very slight reduction	1.99	11.0
„	156	reddish-yellow	„	6	1.4	1.7	+3° 21'	very slight reduction	1.85	10.5
*Amrad ...	85	light brown	strong	3	1.66	1.9	-1° 12'	very slight reduction	1.96	10.9
*Gesirah...	90	reddish-brown	„	7	1.3	1.9	+about 3°	some reduction	2.09	9.8

From the examination of more than 300 samples, the author has found that, as a rule, gums with high tenacity also possess a high viscosity, high acid value, and

* These gave no precipitate with lead acetate.

high negative optical rotation. He gives the subjoined table of the results obtained with abnormal samples.

Commercial Name.	Price per 100 Kilos.	Solution, Specific Gravity 1.035.	Frothing.	Insoluble Matter from 50 Grammes.	Viscosity at 20° C.	Acid Value $\frac{N}{10}$ NaOH.	Rotation α_D .	Action on Fehling's Solution.	Elasticity.	Tenacity.
Arabicum	Marks 96	brown	very strong	c.c. —	2.34	c.c. 9.8	+ about 1°	no reduction	Per cent. 1.90	13.5
*Senegal...	121	„	moderate	2	1.66	1.5	+ 9° 8'	very slight reduction	2.02	12.1
Gesirah...	120	reddish-brown	„	8	1.28	2.05	+ about 5°	some reduction	1.87	11.9
Senegal...	110	reddish-brown	„	16	1.57	2.95	—	marked reduction	1.78	12.7
*Kordofan	110	reddish-brown	„	5	1.13	1.6	—	reduction perceptible	1.51	9.3
„	130	dark brown	very strong	15	1.21	1.3	—	reduction some	1.68	9.1
*Senegal...	121	pale	moderate	60	1.75	1.7	+ 8° 31'	reduction some	2.15	12.6
„	88	pale, turbid	strong	65	6.27	2.1	- 4° 52'	reduction very slight	2.22	12.9

C. A. M.

Volumetric Estimation of Morphine with Potassium Iodate and Alkaline Arsenious Acid. C. Reichard. (*Chem. Zeit.*, 1901, xxv., 328.)—This article consists principally of a discussion of the test for morphine in which potassium iodate and a mineral acid are used. It is known that a yellow or brown colour or a reddish-brown precipitate appears, and that on adding ammonia a very dark and quite permanent brown colour is produced. Based on this reaction, Reichard suggests a volumetric method of determining the alkaloid. The morphine, potassium iodate, and sulphuric acid are shaken together till the colour develops, the liquid and precipitate are extracted with chloroform (or less advantageously with carbon bisulphide), and the free iodine in the solution is titrated with alkaline arsenious acid. One atom of iodine is equivalent to 3 molecules of morphine hydrochloride, or 2 atoms of iodine to 3 of the sulphate.

Referring to his previous article (*Chem. Zeit.*, 1900, xxiv., 1061), Reichard now finds that an ammoniacal solution of silver chloride is to be preferred to silver nitrate, especially in dealing with morphine hydrochloride. The silver process is available for estimating the alkaloid in opium, further experiments thereon being in progress.

F. H. L.

Detection and Estimation of Morphine. F. Wirthle. (*Chem. Zeit.*, 1901, xxv., 291.)—Kippenberger has lately proposed a mixture of chloroform with 10 per cent. of alcohol as the immiscible solvent for recovering morphine from aqueous solutions, and he prescribed that it should be employed on a liquid which, originally

* These gave no precipitate with lead acetate.

alkaline, had been treated with a bicarbonate to destroy the alkali hydroxide. The process is not satisfactory; but if the solution is made slightly acid with hydrochloric acid and then alkaline with ammonia, Kippenberger's solvent works perfectly. For quantitative purposes, between five and nine extractions are necessary; and a small loss of water of hydration which occurs when morphine hydrochloride is dried for one hour, balancing a small quantity of foreign matter extracted by the chloroform, the results of the method are approximately correct. Marquis's quantitative process with ethyl acetate cannot be recommended.

Marquis's qualitative test for morphine—a violet colour* on adding a few drops of a reagent containing 3 c.c. of strong sulphuric acid and 2 drops of formalin—is not characteristic; but it is so delicate (showing fractions of a decimilligramme) and so easy to carry out, that it should be serviceable in examining aqueous liquids to see if they have been completely extracted as above. The various colours of the Pellagri test, which is so very characteristic of morphine, appear in the presence of several decimilligrammes of the alkaloid.

F. H. L.

Separation of the Active Constituents of Frangula, Sagrada, and Rhubarb.
E. Aweng. (*Apoth. Zeit.*, 1901, xvi., 257; through *Chem. Zeit. Rep.*, 1901, 125).—The material in fine powder is extracted with boiling water and an equal volume of 95 per cent. alcohol is added to the liquid. It is filtered and concentrated till its weight is one half that of the sample taken. When cold, enough alcohol is introduced to make the whole contain 80 per cent. of spirit by volume. The mixture is allowed to rest for several days, and the frangulic acid which separates is washed with absolute alcohol and ether, then dried over sulphuric acid. It forms a light brownish-yellow powder, easily soluble in 50 per cent. spirit, slightly soluble in water. The filtrate contains a double glucoside, a compound of frangulic acid with pseudo-frangulin. It is diluted with water and then evaporated, the product appearing as an amorphous red mass. This is soluble in water and in absolute alcohol; it is thrown down from the latter by dry ether in canary-yellow flakes. The compound splits up when its solution in 95 per cent. alcohol is treated with acetic acid, yielding frangulic acid and pseudo-frangulin, which dissolves in alkalis with a blood-red colour. The author finds in frangula bark 10.66 per cent. of the double glucoside and 3 per cent. of the acid; in sagrada, 14 and 3.7 per cent. respectively; in Shens-rhubarb, 35.5 and 1.8 per cent.; and in the *R. rhaponticum*, 29.4 and 3.8 per cent.

F. H. L.

ORGANIC ANALYSIS.

The Quantitative Estimation of Hydrogen Sulphide in Illuminating Gas.
C. C. Tutwiler. (*Journ. Am. Chem. Soc.*, xxiii., 173).—The following method gives good results when a rapid estimation of hydrogen sulphide is required, as in testing the efficiency of a purifier. The gas is passed through a burette of special construction until the latter is filled with it, and mercury then run in from a levelling bulb until 100 c.c. of gas at atmospheric pressure remain in it. The mercury is then with-

* Cf. Kobert, *ANALYST*, 1899, xxiv., 241.

drawn so that the gas is under diminished pressure and exactly fills the burette, which is disconnected from the mercury reservoir. Five c.c. of starch paste are then sucked in, and then drop by drop, with constant shaking, a standard solution of iodine, which is supplied from a graduated measure fitted to the upper part of the gas burette, until the blue colour is permanent. Three grains of hydrogen sulphide in 100 cubic feet of gas can be detected in this way.

A. G. L.

Determination of Sulphur in Benzol for use in Gas-works. W. Irwin. (*Journ. Soc. Chem. Ind.*, 1901, 440.)—The method is an adaptation of Allen's test for sulphur in fats, and is carried out in the ordinary apparatus for estimating sulphur in gas, the burner being replaced by a small lamp. Of the benzol to be tested 10 c.c. are measured into the spirit-lamp, 90 c.c. of alcohol are added, and the determination is carried on as usual.

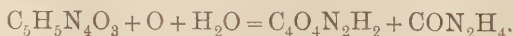
A. M.

Estimation of Indican in Urine by means of Isatin and Hydrochloric Acid. J. Bouma. (*Zeits. physiol. Chem.*, 1901, xxxii, 82; through *Chem. Zeit. Rep.*, 1901, 131.)—The urine is precipitated with one-tenth its volume of lead acetate, the filtrate is mixed with an equal bulk of a solution of isatin in hydrochloric acid, and the whole is heated on the water-bath for fifteen minutes till it becomes (usually) dark red. When cold, it is extracted with chloroform, the solvent removed, and the residue dried for two hours at 110° C. The mass is next completely extracted with hot water to dissolve the excess of isatin (which has passed into the chloroform and would absorb permanganate in the final titration), and dried again. It is then treated with sulphuric acid and titrated with permanganate, calculating the result as indigo-red disulphonic acid. For clinical purposes a colorimetric process gives approximate accuracy: 20 c.c. of urine are treated with 2 c.c. of lead acetate and filtered through a dry paper; 5.5 c.c. of the filtrate are mixed in a tube with 5 c.c. of a solution of 20 milligrammes of isatin in 1 litre of HCl (this 5 c.c. is sufficient for urines containing indoxyl equivalent to 20 milligrammes of indigo). The liquid is boiled for a few seconds, cooled, well shaken with 5 c.c. of chloroform, and the colour which develops is compared with a set of standards prepared with indigo-red.

From numerous experiments the author finds that the yield of indigo-blue is considerably less than one half that of indigo-red, but that there is no fixed relation between them. It appears also that the yield of indigo-red as above is rather more than double that of the total indigo pigments when the ferric chloride and hydrochloric acid method is adopted. This peculiarity is explained by a more perfect conversion of the indoxyl into indigo when using the isatin process.

F. H. L.

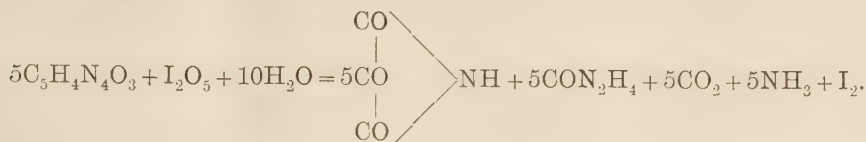
The Determination of Uric Acid in Urine. H. Bouillet. (*Bull. Soc. Chim.*, 1901, xxv., 251-255.)—This method is based upon the fact that iodic acid decomposes uric acid, yielding in the first place alloxan and urea:



The alloxan is then hydrolysed, and there is a liberation of carbon dioxide and of ammonia, which combines with the excess of iodic acid:



The final equation, which the author states has been confirmed by all his determinations, is:

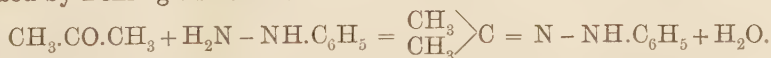


The uric acid is precipitated as barium urate by adding barium chloride to 100 c.c. of the urine, previously neutralized with sodium hydroxide, until no more precipitate is formed. The liquid is then acidified with 5 c.c. of acetic acid (1 : 100), and left for fifteen to twenty minutes, after which the precipitate, consisting of urate, phosphate and sulphate of barium, is collected and washed.

It is next washed with a jet into a porcelain dish, the total volume of liquid and precipitate being 100 to 150 c.c. The uric acid is liberated by the addition of 20 c.c. of sulphuric acid (1 : 10), and the liquid heated to the boiling-point. At that moment 10 c.c. of a standard solution of iodic acid are introduced, and the boiling continued until all the iodine has been expelled. When cold the residual iodic acid is determined by adding 10 c.c. of hydrochloric acid (1 : 10), 30 c.c. of potassium iodide solution (1 : 10), and titrating the liberated iodine with $\frac{N}{10}$ thiosulphate. The difference between the amount of iodic acid taken and left, multiplied by 0.007, gives the amount of uric acid. The accuracy of the results thus obtained is illustrated by test experiments.

C. A. M.

A Gas-Volumetric Method of Determining Acetone in Urine. E. Riegler. (*Zeit. anal. Chem.*, 1901, xl., 94-97.)—This method is based on the facts that if phenyl-hydrazine be shaken with hot Fehling's solution, the whole of its nitrogen is liberated, but that if acetone be present a hydrazone is produced which is not decomposed by Fehling's solution.



The reagents required are: (1) A solution of 1 gramme of crystallized phenyl-hydrazine hydrochloride in 50 c.c. of water, filtered if necessary; (2) a 15 per cent. solution of copper sulphate; and (3) a 15 per cent. solution of sodium hydroxide.

In the author's method 10 c.c. of the phenyl-hydrazine sulphate solution are placed in the exterior evolution flask of a Knop-Wagner nitrometer, 40 c.c. of water added, and 10 c.c. of the sodium hydroxide solution introduced. Ten c.c. of the copper sulphate solution are placed in the inner vessel of the apparatus, and after ten minutes the flask is thoroughly shaken, and the liberated nitrogen collected and measured.

In determining the acetone in urine, 50 c.c. of the latter are mixed with 1 c.c. of glacial acetic acid and distilled, the distillate being collected in a flask containing

10 c.c. of the phenyl-hydrazine solution and about 1 gramme of crystallized sodium acetate. The distillation is continued until 40 to 45 c.c. of the urine have passed over.

The flask is heated for about fifteen minutes on the water-bath. On cooling, its contents are introduced into the nitrometer, and the nitrogen liberated as in the blank experiment. The difference between the amounts of nitrogen at standard temperature and pressure, multiplied by the factor 2.6, gives the quantity of acetone in milligrammes.

If the urine under examination contains more than 70 milligrammes of acetone in 50 c.c., a smaller volume must be used for the distillation. C. A. M.

The Determination of Free Hydrochloric Acid in the Gastric Juice. Meunier. (*Journ. Pharm. Chim.*, 1901, xiii., 367-369.)—The method proposed by the author is a rapid modification combining those of Gunzbourg and Robin.

Five c.c. of the gastric juice are titrated approximately with $\frac{N}{10}$ sodium hydroxide solution with one drop of Toppfer's reagent (dimethyl-amido-nitro-benzene—D A A B) as indicator. It is difficult to determine the exact point of the change in colour from rose to reddish orange. Hence, from 0.1 to 0.5 c.c. too much alkali is usually added. Let 3 c.c. represent the amount used in a typical determination.

A fresh portion of 5 c.c. of the gastric juice is next titrated with $\frac{N}{10}$ sodium hydroxide, commencing with 2.6 c.c. and adding successively 0.1 c.c. until the 3 c.c. used in the first titration is reached. After each of these additions one drop of the liquid is heated in a porcelain crucible on the water-bath at 60° C., with one drop of Gunzbourg's reagent (phloroglucinol, 2; vanillin, 1; and 80 per cent. alcohol, 100 parts).

After a few minutes the five crucibles are examined. If the contents of the first alone are red, 2.6 c.c. of $\frac{N}{10}$ sodium hydroxide solution are required to neutralize the free hydrochloric acid. If the first, second, third, and fourth, are all red, 2.9 c.c. are required, and so on. C. A. M.

A Comparison between the Bromine and Iodine Absorption Figures of Various Oils. H. T. Vulte and Lily Logan. (*Journ. Amer. Chem. Soc.*, xxiii., 156.)—The authors have carefully revised the bromine and iodine figures for various oils. In the case of bromine, the loss due to the formation of substitution products was also determined by means of the potassium iodate method. The iodine value was determined by the Hübl method; the bromine figure almost exactly as proposed by McIlhiney (*Journ. Amer. Chem. Soc.*, xxi., 1084), except that twenty to thirty minutes were allowed to elapse before the titration. The substitution figure was determined as soon as possible, since the addition products decompose readily. In the following table the oils are divided into five classes, the first one consisting of oils for which the two values are nearly the same. This is probably the case with all vegetable oils of simple constitution:

	Iodine.	Iodine calculated from Bromine.	Difference of Averages.	Difference of nearest Figures.
I. Olive oil ...	79.70—80.40	80.31	0.26	0.09
Cotton-seed oil ...	97.50	97.41—97	0.295	0.09
Poppy-seed oil ...	127.98—128.55	128.37	0.055	0.28
Linseed oil ...	155.12—155.52	154.80	0.52	0.32
Sweet almond oil	90.53—89.64	90.20—89.64	1.08	0.33
Peanut oil ...	100.71—100.76	101.26	0.523	0.50
Whale oil ...	128.00	127.45—127.38	0.585	0.50
Lard oil ...	76.99—77.36	76.03—75.88	1.22	0.96
II. Sperm oil ...	79.95—79.76	82.39—82.08	2.422	2.13
III. Rape oil ...	103.69—103.37	99.03—98.56	4.60	4.17
Castor oil ...	86.32—87.15	78.74—78.71	8.01	7.58
IV. Seal oil ...	93.31—93.99	103.09—103.74	9.765	9.10
Cod-liver oil ...	122.09—122.79	132.86—132.18	10.08	9.39
Menhaden oil ...	176.5—175.65	186.94—186.86	10.825	10.36
V. Resin oil ...	59.67—58.95	10.60—10.26	48.845	48.35

The following table gives the substitution figures for all oils examined which formed substitution products. Some of the oils were rancid, and it is probably due to this fact that sweet almond oil showed substitution :

	Total Bromine.	Addition Figure.	Substitution Figure.	Average Substitution Figure.
Cod-liver oil ...	85.16—84.67	84.52—84.09	0.63—0.58	0.605
Menhaden oil ...	120.10—120.30	118.88—118.93	1.22—1.27	1.245
Sweet almond oil	59.54—59.15	57.38—57.02	2.16—2.13	2.145
Sperm oil ...	54.61—54.56	52.41—52.21	2.20—2.34	2.27
Castor oil ...	52.62—52.80	50.09—50.07	2.53—2.73	2.63
Resin oil ...	108.67—109.23	6.74—6.47	101.93—102.76	102.345

A. G. L.

On the Heat of Combustion as a Factor in the Analytical Examination of Oils, and the Heats of Combustion of some Commercial Oils. H. C. Sherman and J. F. Snell. (*Journ. Amer. Chem. Soc.*, xxiii., 164.)—Although the heats of combustion of fatty oils cannot be used as a means of distinguishing between them, since the variations are too small, the determination is of value in comparing oils rich in hydroxyacids with waxes or non-fatty oils. The oxidation consequent on drying also leads to a loss of calorific power, and this is sometimes of more value than the determination of increase of weight, which may be vitiated by the presence of some volatile oil like petroleum. In some drying experiments with linseed oil, a loss of 10 per cent. of calorific power was found, whilst lard subjected to the same treatment lost less than 1 per cent.

The heats of combustion given below were obtained with a bomb-calorimeter, and are the means of at least two determinations, the average deviation from the mean being ± 0.12 per cent. To reduce the values found at constant volume to heats of combustion at constant pressure,

$$\frac{1}{2} (p - g) \frac{T}{M} \text{ calories per gramme}$$

were added, p being the number of atoms of hydrogen, and g the number of atoms

of oxygen present in the molecule, M the molecular weight, and T the absolute temperature of the calorimeter. The values for the specific gravity, iodine absorption, and acidity were determined as usual:

Description of Oil.	Specific Gravity, 15.5° 15.5	Iodine Absorption, Per Cent.	Free Acid as Oleic, Per Cent.	Heat of Combustion, per Gramme.	
				Constant Volume. Calories.	Constant Pressure. Calories.
Raw linseed, I., 1900, fresh	0.934	182.4	4.30	9,364	9,379
" II., 1898	... 0.938	175.9	1.22	9,379	9,394
" III., old	... 0.947	156.7	5.30	9,215	9,230
Boiled linseed	... 0.953	150.7	7.40	8,810	8,824
Poppy-seed	... 0.926	129.6	2.66	9,382	9,397
Maize oil, I., 1900	... 0.924	120.3	3.32	9,413	9,428
" II., 1898	... 0.926	120.7	2.56	9,436	9,451
" III., crude	... 0.926	122.4	1.68	9,419	9,434
Cotton-seed, I., prime yellow	0.920	102.5	0.20	9,396	9,411
" II., choice yellow	0.921	106.4	0.32	9,401	9,416
" III., choice white	0.923	105.5	0.08	9,390	9,405
" IV., crude	... 0.927	103.2	2.28	9,397	9,412
" V., crude	... 0.927	—	—	9,336	9,351
" VI., rather old	... 0.929	100.1	0.92	9,323	9,338
" VII., old	... 0.941	93.7	2.03	9,168	9,183
Sesame	... 0.924	105.3	1.65	9,395	9,410
Rape-seed, I.	... 0.922	107.4	0.82	9,489	9,504
" II.	... 0.920	108.6	0.68	9,462	9,477
" III.	... 0.926	99.3	2.94	9,412	9,427
Castor, I.	... 0.967	84.1	0.26	8,863	8,877
" II.	... 0.964	86.9	2.18	8,835	8,849
Pea-nut (arachis)	... 0.917	105.9	0.16	9,412	9,427
Almond, I.	... 0.919	98.1	5.13	9,454	9,469
" II.	... 0.931	89.8	7.00	9,311	9,326
Olive, I.	... 0.917	85.1	2.51	9,457	9,472
" II.	... 0.916	78.8	0.40	9,451	9,466
Menhaden, refined	... 0.935	—	0.36	9,360	9,375
" crude	... 0.934	—	1.92	9,371	9,386
Cod-liver, fresh	... 0.927	165.6	0.56	9,437	9,452
" old	... 0.938	137.3	1.50	9,277	9,292
Whale	... 0.924	126.6	0.60	9,473	9,488
Lard oil, I., 1900	... 0.917	74.3	0.74	9,451	9,466
" II., 1899	... 0.919	72.5	1.25	9,447	9,462
" III.	... 0.922	72.9	2.64	9,394	9,409
" IV.	... 0.924	69.3	2.34	9,372	9,387
Sperm oil	... 0.886	78.7	0.78	9,946	9,964
Rosin oil	... 0.989	76.9	14.40	10,145	10,159
Lubricating petroleum, I.	0.881	—	—	10,797	10,819
" " II.	0.897	—	—	10,753	10,775
" " III.	0.905	—	—	10,682	10,704

The variations of the heats of combustion appear to be more closely related to those in the specific gravities than to those in the iodine or acidity values. The product of large calories into specific gravity at 15.5° is nearly constant at 8.80 to 8.63 for the fatty oils. Castor and boiled linseed oils show lower; sperm,

mineral, and rosin oils higher values. By dividing the heat of combustion by the specific gravity, a nearly constant value of 10.0 to 10.3 is obtained for the fatty oils, whilst sperm and mineral oils show a much higher value (11.2 for sperm oil and 11.8 to 12.3 for mineral oils).

A. G. L.

Calorimetric Determination of Heating Value. K. Kroeker. (*Zeits. angew. Chem.*, 1901, 111.)—A criticism of Langbein's paper (*ANALYST*, 1901, 81). The correction introduced by Langbein for sulphur does not eliminate error, but introduces it, for in the bomb it is not all burnt to trioxide, but some sulphur dioxide is formed; on the other hand, in the furnace some trioxide is formed. The author also gives a description of the calorimetric bomb now used by him. This is made either with enamelled inner surface, or is coppered, and platinum foil is then soldered on.

A. M.

Ammonium Persulphate as a Reagent for Alkaloids. N. A. Orlow and P. K. Horst. (*Farmaz. J.*, 1901, xl., 91; through *Chem. Zeit. Rep.*, 1901, 105.)—Ammonium persulphate gives the following reactions with alkaloids: Cocaine, a white precipitate soluble in excess, separating as a thick colourless liquid at the bottom of the tube; strychnine, a white pulverulent precipitate. In presence of sulphuric acid, chelidone gives a yellow colour changing to green and then brown; chelerythrine, a violet to black; sanguinarine, dark brown. Corydaline, yellow, dirty green, dirty yellow. Bulbocapnine, blue then violet. Morphine, pale orange. Codeine, orange. Narcotine, orange red. Papaverine, yellow. Narceine, violet, blood-red, yellow. Apomorphine, green to blue. No colours are produced by cocaine, pilocarpine, caffeine, aconitine, colchicine, colchicine, and quinine.

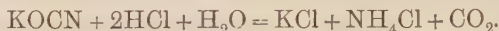
F. H. L.

Chrome-Hide Powder for Analysis of Tanning Materials. B. Weiss. (*Gerber*, 1901, xxvii., 29; through *Chem. Zeit. Rep.*, 1901, 105.)—This modification of ordinary hide powder is prepared as follows: 100 grammes of powder are shaken up with 2 litres of water, and treated with (altogether) 3 grammes of chrome alum dissolved in 100 c.c. of water on three successive days. The product is filtered, and then washed by alternate agitation with fresh water and filtration till sulphuric acid can no longer be detected, 10 c.c. of 40 per cent. formalin being added to the last quantities of water. Finally, the hide powder is lightly pressed, rubbed down in the hands, and preserved in the damp. The material keeps well, and it is only necessary to determine the moisture in it occasionally. In carrying out an analysis of a tanning material, 130 c.c. of its solution are well agitated with that weight of treated hide powder which corresponds to 7 grammes of the dry product; the whole is allowed to rest overnight, then filtered, and the insoluble matter dried and weighed as usual.

F. H. L.

Determination of Cyanic Acid in Commercial Cyanides. O. Herting. (*Zeits. angew. Chem.*, 1901, 585.)—The cyanide is dissolved in water, dilute hydro-

chloric acid or sulphuric acid is added, and the liquid is evaporated to dryness in a water-bath. The cyanate is decomposed according to the equation :



The ammonia produced is determined by distilling with excess of soda in the usual way, and the percentage of cyanic acid is calculated from it. The cyanide should of course be tested for ammonia, and if it be present it should be determined and allowed for in calculating the cyanic acid.

A. M.

The Classification of Acidimetric and Alkalimetric Indicators. Julius Wagner. (*Zeit. Anorg. Chem.*, xxvii., 138.)—About two years ago F. Glaser divided indicators into three groups (*Zeit. Anal. Chem.*, xxxviii., 273). His division was based not on the chemical character of the indicators, but on their delicacy. His first group embraces feeble basic and actually acid substances, delicate towards alkalis, but not towards acids, *e.g.*, tropæolin OO, methyl-orange, congo-red. The second group includes acid indicators, mostly phenols, delicate towards feebler acids, but less sensitive towards bases, *e.g.*, fluorescein, litmus, *p*-nitrophenol. The third group consists of indicators even less acid, and consequently sensitive towards very feeble acids, but only reacting with the strongest alkalis, *e.g.*, turmeric, phenolphthalein, Poirrier's blue.

The author of the present paper prefers to class indicators according to their chemical character, having regard, in the first instance, to the manner in which they form ions, and then to form subgroups according to their delicacy, as follows :

A. Indicators with a monovalent characteristic ion: (1) with an anion; (2) with a kation.

B. Indicators with a polyvalent ion: (1) with positive and negative ions; (2) with mono- and di- valent anion or kation.

The two main groups are distinguished by the appearance or non-appearance of an intermediate colour, which, under certain conditions, allows of the determination of different anions or kations by means of the same indicator.

Indicators belonging to group A (1) are only slightly dissociated in acid solution. Their dissociation increases with the disappearance of the hydrogen ions, and is slower the feebler the acid nature of the indicator. Consequently, in this case strong bases must be used for the titration, whilst for weaker bases a more acid indicator must be used. The majority of indicators belong to this group, *e.g.*, fluorescein, *p*-nitrophenol, turmeric, litmus, phenolphthalein, and Poirrier's blue.

Group A (2) only contains two indicators, viz., methyl violet and amido-azo-benzol.

Indicators belonging to group B (1) form differently coloured ions in acid and alkaline solution, and their behaviour may be likened to that of aluminium hydroxide. An intermediate colour is consequently possible, and has been actually observed in the case of methyl-orange, and of a few others. All are strongly acid, and can be used even for weak bases like ammonia. Tropæolin OO, methyl- and ethyl-orange, and congo red are members of this group.

All the indicators included in group B (2) are acid, and resemble phosphoric

acid in their behaviour. They permit of the titration of two acids present together, provided that one is much weaker than the other. Alizarin-sulphonic acid, which is yellow in acid solution, and turns first red and then violet on treatment with alkali, is an example of this group. Gallein and phenacetolin also belong to it.

In group A (1) a new indicator seems to be required, which would give a sharp end reaction when a carbonate is titrated with a strong acid. In group B (2) also an indicator is wanted which would give good results when two acids are present together.

A. G. L.

Occurrence of Zinc in Plants. L. Laband. (*Zeit. für Untersuch. der Nahr. und Genussmittel*, 1901, 489.)—The author has estimated the amount of zinc in plants grown on soils containing a considerable quantity of zinc salts. The plants, which appeared quite healthy, were, after cleaning, dried at 100° C.; 100 grammes of the dry substance were heated with concentrated sulphuric acid and mercury until the solution was colourless. On dilution with water a little calcium sulphate crystallized out. Sulphuretted hydrogen was then passed through the strongly acid solution, the mercury sulphide filtered off and the excess of sulphuretted hydrogen driven off on the water-bath. After separating the phosphoric acid in the filtrate by means of tin and hydrochloric acid, the zinc was precipitated with sulphuretted hydrogen in acetic acid solution. The precipitate of zinc sulphide was filtered, washed with acetic acid, dissolved in hydrochloric acid, again thrown down as sulphide, and finally weighed as oxide. A hundred grammes of dry plants gave 0.252 gramme of zinc oxide. A second estimation, in which the zinc was determined electrolytically, gave 0.202 per cent. of zinc.

W. P. S.

A Modification of the Method of Titrating with Permanganate. J. Gailhat. (*Bull. Soc. Chim.*, 1901, xxv., 395-401.)—The author has found that in the presence of an excess of manganous sulphate (MnSO_4) and of 20 per cent. by volume of sulphuric acid, solutions of potassium permanganate only lose on boiling a very slight trace of the oxygen which acts upon oxalic acid.

The amount of this loss depends upon the acidity of the liquid and of the concentration of the permanganate solution. If, however, the strength of the solution does not exceed 15 grammes per litre, the loss remains constant, whether the duration of boiling be five minutes or an hour.

It is thus possible to titrate substances which are readily oxidized under these conditions.

A definite volume of permanganate solution is mixed with an excess of manganous sulphate, and rendered acid with sulphuric acid. It is boiled for five minutes, and then titrated with a standard solution of oxalic acid.

An equal volume of the same permanganate solution, etc., is also boiled for five minutes, after which a weighed quantity of substance under examination is introduced, the boiling continued for an hour under a reflux condenser, and the liquid titrated as before. The difference between the two titrations gives the oxygen consumed by the substance.

The author has obtained very concordant results by this method in the analyses of crude and commercial glycerins.

C. A. M.

INORGANIC. ANALYSIS.

Determination of Arsenic in Coke. L. Archbutt and P. G. Jackson. (*Journ. Soc. Chem. Ind.*, 1901, 448.)—The coke is dried at 100° C., 50 grammes are taken and heated for at least two hours with 100 c.c. of pure nitric acid (1.42). Water is added to 400 c.c., and after settling the coke is filtered off on a toughened filter and washed. The filtrate is evaporated to dryness on a water-bath, the residue is mixed with 25 c.c. of concentrated sulphuric acid and heated with stirring. The heating is continued until fumes of sulphuric acid come off. Cold water is added to dissolve, and then it is again evaporated until fumes come off once more. This is repeated at least three times, till all the nitric acid is driven off. The residue is then transferred to a distillation-flask fitted with a thermometer and a condenser, the tube of which dips below the surface of about 20 c.c. of water contained in a receiving flask. Twenty-three grammes of sodium chloride and 2 grammes of ferrous sulphate are added to the liquid in the flask, which should be quite cold, and not more than 100 c.c. in volume. Distillation commences at about 110° C., and is continued until the temperature reaches 125° C., when the whole of the arsenic will be found in the distillate. To the latter is added a little zinc sulphide, and it is agitated for a few minutes until the precipitate has coagulated. The precipitate is filtered on a hardened filter, washed with sulphuretted hydrogen water, rinsed into a flask, boiled with 300 c.c. of water, the filter-paper is added, and boiling is continued another hour. The liquid is filtered, concentrated to about 40 c.c., cooled, $\frac{1}{2}$ gramme of sodium bicarbonate is added and some starch solution, and the liquid is rapidly titrated with centinormal iodine solution. Practice should be acquired by titrating sulphide of arsenic precipitated from known quantities of a standard solution. A blank determination should be made. A. M.

Arsenic in Coal and Coke. R. F. Wood Smith and R. L. Jenks. (*Journ. Soc. Chem. Ind.*, 1901, 437.)—The fuel is burnt in a combustion-tube about 20 inches long. About 4 inches from one end this is constricted to a diameter of about 2 millimetres. The next inch is left to form a bulb, and the last 3 inches are drawn out and led into a wash-bottle containing sulphuric acid. Five to 15 grammes of the fuel are weighed out and introduced into the tube and burnt in a current of air, the products of combustion being passed through the wash bottle. The heating lasts about three hours. When the tube is cold the ashes are withdrawn, and laid aside for the determination of "fixed" arsenic, whilst the contents of the bulb are washed into the bottle by means of a pipette long enough to reach down to the constriction, or the tube may be severed at the constriction. The ashes are triturated in a mortar, washed with dilute sulphuric acid into a flask, warmed for a few minutes, and then allowed to stand at least twelve hours. The liquid is then diluted, an aliquot part is taken, heated in a water-bath and passed into the Marsh apparatus. The contents of the wash-bottle are also made to a definite bulk, and an aliquot part is transferred to the Marsh apparatus. The latter portion is returned as "volatile arsenic." A. M.

The Titration of Arsenious Acid with Potassium Permanganate. O. Kühling. (*Berichte*, 1901, xxxiv., 404-406.)—If arsenious acid be dissolved in a solution of potassium hydroxide, and a sufficient quantity of zinc sulphate added, permanganate solution is decolorized, even in the cold. But when from 70 to 80 per cent. of the arsenious acid has been oxidized, the reaction proceeds very slowly, and it is necessary to add the permanganate in small amounts (not more than 0.2 c.c.), and to heat the beaker for fifteen to thirty minutes on the water-bath after each addition, until finally the red colour persists after thirty minutes' heating.

The potassium hydroxide should be purified by crystallization from alcohol, and the aqueous solution freed from alcohol by repeated evaporation on the water-bath.

If an excess of alkali be avoided, an initial addition of 20 c.c. of 10 per cent. zinc sulphate solution is sufficient, a little more being added when the oxidation process becomes too slow. In this reaction $2\text{KMnO}_4 (=3\text{O})$ oxidize $\frac{3}{2} \text{As}_2\text{O}_3$.

As this method is too tedious for ordinary use, the author has devised the following method of accelerating the oxidation: The arsenious acid is dissolved in hot sulphuric acid (30 to 40 per cent. strength), in a flask previously cleansed with permanganate and sulphuric acid. The solution is diluted to 100 c.c., and heated to the boiling-point, whilst potassium permanganate solution is introduced, rapidly at first, and subsequently more slowly. After each addition the liquid is heated for one to two minutes nearly to the boiling-point, this process being continued until the red colour no longer disappears.

In this method $2\text{KMnO}_4 (=5\text{O})$ correspond to $\frac{5}{2} \text{As}_2\text{O}_3$.

The following results are typical of those obtained by these methods:

	Taken As_2O_3 gramme.	Found, gramme.
I.	0.2158	0.2171
	0.2171	0.2177
II.	0.2173	0.2177
	0.2178	0.2183

C. A. M.

Valuation of Gold Sodium Chloride. Johnson and Sons. (*Journ. Soc. Chem. Ind.*, 1901, xx., 210.)—Fifteen grains of the double chloride are dissolved in 1 ounce of water, the gold is precipitated with sulphurous acid, filtered off, ignited and weighed. Simultaneously 7 grains of pure gold are dissolved in aqua regia, evaporated, redissolved in water, precipitated, etc., exactly as before, using filters of the same weight. The object of this blank test is to fix the amount of loss in the process, and a corresponding addition is made to the yield of metal from the gold sodium chloride. The results are correct to the second place of decimals.

F. H. L.

Notes on the Precipitation of Metals with Sodium Thiosulphate. E. Donath. (*Zeit. anal. Chem.*, 1901, xl., 141-143.)—It was shown by Wolcott Gibbs (*Zeit. anal. Chem.*, iii., 386) that sodium thiosulphate precipitated many metals as sulphides from their boiling solutions in hydrochloric or sulphuric acids. The author has studied the behaviour of the reagents with acetic acid solutions, and has observed the following facts:

When a solution of cadmium chloride or sulphate is treated with ammonia in excess, and then rendered strongly acid with acetic acid, the cadmium is precipitated quantitatively by adding powdered thiosulphate to the boiling liquid and continuing the boiling for thirty minutes, with the occasional introduction of a few drops of acetic acid.

When a solution of zinc is treated in the same way, there is a precipitate of sulphur, which only contains traces of zinc. A quantitative separation, however, is not possible, since in the presence of cadmium considerably larger quantities of zinc sulphide are precipitated.

Solutions of nickel and cobalt salts behave in an analogous manner, nickel being quantitatively precipitated, whilst pure cobalt solutions give no precipitate except finely-divided sulphur. If, however, a nickel solution be mixed with a solution of cobalt or of manganese, or iron sulphate, the nickel sulphide will contain more or less of the sulphides of these metals.

It is thus possible to detect minute traces of nickel by the fact that when present in a solution of cobalt a precipitate of nickel sulphide contaminated with cobalt is obtained.

C. A. M.

Determination of Titanic Acid in Titanium Iron Ores. J. H. L. Vogt. (*Stahl und Eisen*, xxi., 283; through *Zeitschrift für angew. Chem.*, 1901, 550.)—According to the author, 2.5 grammes of the ore are dissolved in hydrochloric acid, and potassium sodium carbonate is added to the insoluble residue. Silicic acid is separated in the usual manner, and is weighed and treated with hydrofluoric and sulphuric acids. The remaining titanic acid is brought into solution by fusing with acid potassium sulphate. By the addition of ammonia and bromine oxide of iron, alumina, manganese peroxide, phosphoric acid and titanic acid are precipitated. They are filtered and weighed. They are then dissolved in hot concentrated hydrochloric acid, the solution is exactly neutralized, then acidified with a few drops of sulphuric or hydrochloric acid. The ferric salts are reduced with sulphurous acid and the solution is boiled for at least one hour, thus precipitating titanic acid mixed with some alumina, phosphoric acid and a little oxide of iron. The liquid is filtered through a double filter, and the filtrate is again treated in the same manner. The residue is melted with pure soda for a considerable time over the blow-pipe to convert the alumina and phosphoric acid into soluble aluminates and phosphates, whilst the titanic acid forms sodium titanate insoluble in cold water. The latter is filtered off, washed with cold water, dissolved in hydrochloric acid, and after neutralization and the addition of sulphurous acid, the titanic acid is precipitated by boiling as described above.

A. M.

Determination of Calcium in High-grade Ferro-silicon. G. W. Gray. (*Journ. Soc. Chem. Ind.*, 1901, 538.)—One gramme of the finely-ground sample is fused with about 4 grammes of potassium carbonate. The mass is dissolved out of the crucible as far as possible with water and hydrochloric acid, and the remainder is removed by fusing with potassium bisulphate. The iron is brought into solution with nitric acid. Silica, iron, calcium, etc., are separated and determined in the usual way.

A. M.

Rapid Estimation of Prussian Blue in Spent Oxide. J. M. Popplewell. (*Journ. Soc. Chem. Ind.*, 1901, xx., 225.)—Five grammes of the sample are boiled for five minutes with 50 c.c. of 5 per cent. sodium hydroxide. The filtrate is brought to the boil, mixed with 50 c.c. of 5 per cent. ferric chloride solution, and acidified with hydrochloric acid. If the precipitate of Prussian blue and sulphur appears in a finely-divided state, giving the solution a pale blue colour, more ferric chloride is added, till either the liquid is dark red (thiocyanates) or till the precipitate settles. This is filtered off and agitated for ten minutes in the cold with 50 c.c. of 5 per cent. caustic soda; filtered again, and the filtrate acidified with sulphuric acid, brought into a porcelain basin, and titrated cold with copper sulphate, using spots of 1 per cent. ferric chloride as indicator. The copper sulphate should contain 12.48 grammes of crystals per litre, and is equivalent to 0.01056 gramme of potassium ferrocyanide, or to 0.0072 gramme of Prussian blue, per 1 c.c. The process gives results which agree well with those of Knublauch's method (of which it is a modification). Drehschmidt's method shows higher figures, as it returns certain cyanogen compounds which are not ferrocyanides, and which do not yield Prussian blue. F. H. L.

Estimation of "Available" Constituents in Soil. B. Sjollem. (*Chem. Zeit.*, 1901, xxv., 311.)—Processes like that of Dyer for the estimation of available phosphoric acid in soil, which are based on the extraction of a given weight of the sample for a prescribed time with a given quantity of some solvent, depend for their utility on the assumption that the whole of (that portion of) the constituent which is actually soluble in the liquid employed dissolves during the operation. This, however, is not correct; the speed of dissolution falls off rapidly, and when a state of equilibrium has been reached, there is no proof that all the available matter has been recovered. Sjollem quotes the results obtained on two soils, which show this: One was a light clay, that yielded 0.092 per cent. of phosphoric acid to boiling 12.8 per cent. nitric acid, this being presumably almost, if not quite, the whole of the phosphorus. When 50 grammes were treated by the Dyer process, 0.019 per cent. of phosphoric acid was obtained; and when the same sample was extracted again with citric acid, another 0.0185 per cent. was recovered. By treating the same soil with small separate quantities of solvent, allowing, say, 75 c.c. to act upon 50 grammes for a few hours with occasional agitation, running off the liquid, rinsing with 25 c.c., then soaking with 50 c.c., rinsing again, and so on, 0.0375 per cent. of phosphoric acid was eventually dissolved; and by percolation of 20 grammes of the soil in a narrow tube for seven days with 1 per cent. citric acid, the yield of phosphoric acid was 0.034 per cent., the total quantity of solvent used being about the same as in Dyer's process. Dyer's process thus returned only half the phosphoric acid really soluble in his reagent. The second specimen, a sandy loam, gave 0.212 per cent. to boiling nitric acid. Dyer's process showed 0.0528 per cent., and on further treatment with his solvent 0.015 per cent. more. Extraction with small quantities of solvent as above gave 0.0724 per cent. Here Dyer's process only returned about 73 per cent. of the phosphoric acid really soluble in 1 per cent. citric acid solution.

The author does not express any opinion as to whether 1 per cent. citric acid

gives results of practical value, but he remarks that by his modification all the phosphoric acid which should (*ex hypothesi*) dissolve does so; and, moreover, in a soil containing much chalk, there is no need to add a larger volume of reagent at first, the extraction being simply repeated a greater number of times. The quantities mentioned above are intended only as suggestions; a larger volume can be used for each extraction, and the rinsing each time may be omitted.

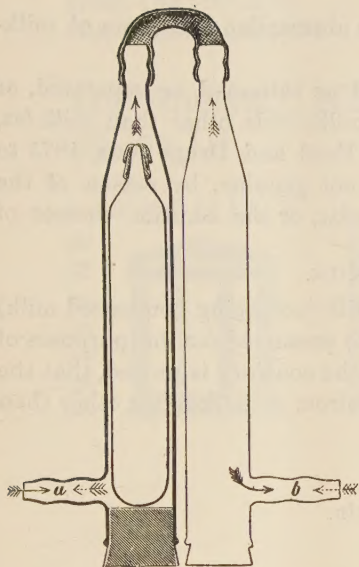
F. H. L.

The Use of Metallic Sodium in Blowpipe Analysis. Charles Lathrop Parsons. (*Journ. Am. Chem. Soc.*, xxiii., 159.)—That sodium may with great advantage be substituted for sodium carbonate in assisting the reducing action of the blowpipe flame has been pointed out by W. Hempel (*Zeits. anorg. Chem.*, xvi., 22), who, however, recommends certain details of manipulation which appear to be quite unnecessary. The reduction may be very simply carried out by flattening a piece of sodium 3 to 4 millimetres in diameter on a smooth surface, spreading the substance to be examined on it, and, after pressing it into the metal, kneading the whole into a ball with a knife. The metal should not be touched with the fingers, as the reaction sometimes commences spontaneously. The ball of sodium is placed on a depression in a block of charcoal and lighted with a match or flame, when a flash ensues, and reduction occurs. On heating the residue in the reducing flame, the sodium compounds sink into the charcoal leaving the metallic particles, which are tested as usual. Volatile metals yield their characteristic incrustations very readily, and the hepar reaction is easily obtained from the charcoal if sulphur was present. The method yields good results with most minerals, even chromite being readily reduced.

A. G. L.

Rough Valuation of Strong or Fuming Sulphuric Acid. H. Rabe. (*Chem. Zeit.*, 1901, xxv., 345.)—This is a simple method of estimating approximately the strength of sulphuric acid which is suitable for use by workmen, etc. It depends on the fact that when a "fuming" acid is gradually diluted with ordinary acid containing less than 100 per cent. of hydrogen sulphate, the mixture continues to yield visible fumes on stirring until the excess of water in the weaker acid combines with the excess of anhydride in the strong acid, and the whole liquid consists of H_2SO_4 . The only laboratory reagent needed is a chemically standardized sample of ordinary acid, if ordinary acid has to be valued, or of fuming acid, if fuming acid is to be examined, which should have roughly the same degree of concentration as the specimen under investigation. This reagent is employed to determine the fuming (or the fume-absorbing) power of a sample of fuming (weak) acid; and then by adding from a burette or pipette the specimen to be tested to the latter acid, the excess of SO_3 or of H_2O in the works sample can be calculated. Titration is performed in a beaker, stirring the liquid after each addition and blowing upon it; artificial cooling is not generally required. Foreign matter, dissolved or suspended, does not affect the results.

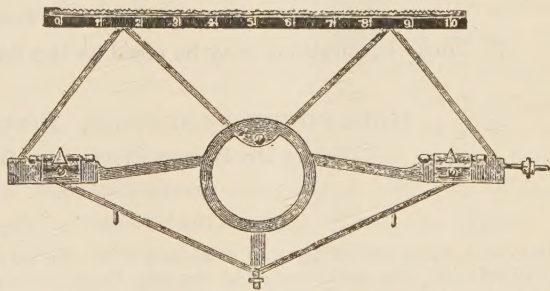
F. H. L.



APPARATUS.

A Glass Gas Trap. K. Scholwein. (*Chem. Zeit.*, 1901, xxv., 397.)—This device is somewhat similar to the "steam trap" of the factory which separates steam from condensed water. There is a clear passage through the apparatus in either direction for any gas; but if liquid obtains access to either of the tubes it lifts the float contained in it, and eventually causes its capped end to make a tight joint against the conical top of the outer vessel. In the sketch the right-hand tube is shown in elevation; it also contains a float resembling that in the left tube. F. H. L.

A Balance of Constant Delicacy. (*Chem. Zeit.*, 1901, xxv., 294.)—The annexed diagram shows the construction of the beam of a balance, which is being patented by G. Hartner, of Ebingen, Württemberg. It differs fundamentally from those in general use by having the upper pair of braces fastened to the ends of the beam outside the pan knife edges. This alteration prevents the gradual distortion of the beam with increasing loads, and renders it absolutely rigid; so that the relative positions of the centre of gravity and the centre of oscillation remain the same as when the balance is swinging empty. One of these balances designed to carry 200 grammes, was loaded with increasing weights up to 800 grammes in each pan; and yet, with an excess of 1 milligramme, always swung 15 divisions of the scale from zero. F. H. L.



SALE OF MILK REGULATIONS, 1901.

THE Board of Agriculture, in exercise of the powers conferred on them by Section 4 of the Sale of Food and Drugs Act, 1899, have made the following Regulations :

MILK.

1. Where a sample of milk (not being milk sold as skimmed, or separated, or condensed, milk) contains less than 3 per cent. of milk-fat, it shall be presumed for the purposes of the Sale of Food and Drugs Acts, 1875 to 1899, until the contrary is

proved, that the milk is not genuine, by reason of the abstraction therefrom of milk-fat, or the addition thereto of water.

2. Where a sample of milk (not being milk sold as skimmed, or separated, or condensed, milk) contains less than 8·5 per cent. of milk-solids other than milk-fat, it shall be presumed for the purposes of the Sale of Food and Drugs Acts, 1875 to 1899, until the contrary is proved, that the milk is not genuine, by reason of the abstraction therefrom of milk-solids other than milk-fat, or the addition thereto of water.

SKIMMED OR SEPARATED MILK.

3. Where a sample of skimmed or separated milk (not being condensed milk) contains less than 9 per cent. of milk-solids, it shall be presumed for the purposes of the Sale of Food and Drugs Acts, 1875 to 1899, until the contrary is proved, that the milk is not genuine, by reason of the abstraction therefrom of milk-solids other than milk-fat, or the addition thereto of water.

EXTENT.

4. These Regulations shall extend to Great Britain.

COMMENCEMENT.

5. These Regulations shall come into operation on the First day of September, One thousand nine hundred and one.

SHORT TITLE.

6. These Regulations may be cited as the Sale of Milk Regulations, 1901.

HIGH COURT OF JUSTICE. KING'S BENCH DIVISION.

(Before Mr. JUSTICE WILLS and Mr. JUSTICE KENNEDY.)

PEARKS AND CO. *v.* KNIGHT.

(From the "*Times*" of August 10, 1901.)

THIS was a case stated by way of appeal from the Stipendiary Magistrate sitting at Longton in Staffordshire, who had convicted the appellants, Messrs. Pearks and Co., of an offence under Section 6 of the Sale of Food and Drugs Act, 1875, in selling butter not of the nature, substance, and quality demanded by the purchaser.

Mr. JOSEPH WALTON, K.C. (Mr. Avory, K.C., and Mr. H. D. Bonsey with him), for the appellants, said that the charge was that after the butter had been made milk was added in order to increase the weight of the butter by reason of the water contained in the milk. In the Margarine Act, 1888, butter was defined as being made of milk or cream. In the present case, that which was sold was not made of anything else. A process of making butter had been adopted which had the effect of making butter with more water in it than if it had not been adopted. There was no standard, and, therefore, so long as the article was made of milk there was no offence. There was nothing in the Act directed against any particular process of manufacture.

The COURT, without calling on Mr. Danckwerts and Mr. B. C. Brough, for the respondent, dismissed the appeal.

Mr. JUSTICE WILLS said that the purchaser asked for butter and he got that which had been butter, but by some ingenious process, the nature of which was probably a trade secret, milk was taken in considerable quantities and introduced into the butter in a state in which it was itself not butter. If it were subjected to the ordinary process by which butter was made and the natural amount of butter were turned out of it the object of the process would not be attained—namely, that some of the watery part of the milk, which would by the natural process of making the butter be turned out of it, should be left in the resulting product. That would not be done unless for the purpose of making a spurious profit. This was a right conviction, and the appeal must be dismissed with costs.

Mr. JUSTICE KENNEDY concurred.